INSY-3600

Engineering Economy

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DUE DATE: 11/4/21

Case Study

# **Problem Summary**

In this case study, we are informed that we are working at the *Muhendis, Inc.* Engineering Company. We are given two options to evaluate from our boss for an investment project. The project would bring benefits to the company and last an estimate of 5 years. We are given two machine options to choose from and it is our goal to choose the best investment for the company that will be most profitable. Below, in *Table 1*, it shows the given data for the two machines.

|  |  |  |  |
| --- | --- | --- | --- |
| **Machine** | **Initial Investment** | **Annual Maintenance** | **Annual Units** |
| **1** | $23,000 | $2,500 | 10,000 |
| **2** | $15,000 | $2,000 | 6,500 |

*Table 1*

We are then given information about the department forecasted for the next 5 year’s demand. We are told that we should meet the demand but not produce more than the demand requires. We can see the 5-year demand in Table 2 below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **1** | **2** | **3** | **4** | **5** |
| **Demand** | 15000 | 16000 | 17000 | 18000 | 19000 |

*Table 2*

After receiving information about unit sales, cost of raw materials, maintenance, and labor costs, our goal was to compute the annual and overall labor cost that fits within the company budget. This information can be found in the provided spreadsheet.

# **Quantified Benefits**

When making an income and cash flow statement for each machine the company proposed, we found that purchasing the first machine twice had better benefits than purchasing the second machine. When going through calculations, the Initial Rate of Return for purchasing the first machine twice was 29%. This is greater than the 20% MARR required. The second machine produced an IRR of 26%. While this does achieve our goal of 20% or greater, the first machine shows better benefits.

Even though we bought two machines for the first machine option, we did not have to double the labor costs, which greatly helped cost benefits for this option. If we were to take a loan for both machine options, we would still choose option one with two machines. Machine 1, with a loan, has an IRR of 33% and a Present Worth of around $14,033, while Machine 2, with a loan, has an IRR of 30% and a Present worth of around $10,844. All calculations and data can be found in the provided spreadsheet. We ultimately decided that the loan would be beneficial for all of the projects.

We were lastly asked to perform a sensitivity analysis ranging from -20% to +20% (in intervals of 5%). We were asked to find the labor cost per hour, material cost per unit, loan rate, the unit price per unit, and initial investment price. The sensitivity analysis was done for the Machine 1 option, as it was the best option for the company. All calculations and data can be seen in the spreadsheet on the Machine 1 tab and the Sensitivity analysis graph is also shown below.

Chart, line chart

Description automatically generated

*Sensitivity Analysis Graph*